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TITLE:        SYSTEM AND METHOD FOR RECORDING AND
              REPRODUCING BROADCASTING PROGRAMS

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# SYSTEM AND METHOD FOR RECORDING AND REPRODUCING

# BROADCASTING PROGRAMS

### CROSS REFERENCE TO RELATED APPLICATIONS

5      This application claims priority from Japanese

Patent Application No. 2000-150726, filed on May 23, 2000

with the Japanese Patent Office, the disclosure of which

is expressly incorporated by reference.


10                    BACKGROUND OF THE INVENTION

Field of the Invention:

This invention relates to a system and a method for

recording and/or reproducing videos of broadcasting

programs or the like sent on the air from broadcasting

15    stations, and in particular, to a recording/reproducing

system, which permits the automated video recording and

recording schedule reservation.

More specifically, the present invention is

concerned with a recording/reproducing system and its

20    method, which may support the reproduction and watching

operations of a large number of automatically recorded

videos, and in particular, to a recording/reproducing

system, which permits the facilitation of selection and

management of recorded videos in the manner of following

25    the operations of general AV equipment such as

televisions and video decks.

Description of the Related Art:

The development of digital techniques is making it

possible to store a mass of AV data composed of video

30    data and audio data without degradation.   Recently, as

HDD having a capacity of several ten GB or more is

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available at relatively low cost, HDD-based recorders are coming on to the market as well (Refer to reports of "Apparatuses to record television programs into HDD are coming out one after another (by Nikkei Electronics, No. 727, pp. 27 to 28, 1998) and "HDD-based digital recording techniques for domestic use come out at last" (by Nikkei Electronics No. 727, pp. 41 to 46, 1998)). With the increasing capacity of recording media, recording of more programs is made possible in a program recording/reproducing apparatus.

The HDD is a device, which is random-accessible to data recorded therein. Thus, the HDD may start reproduction directly from a user's favorite program without the need for reproducing the recorded programs from the top in sequence, dissimilarly to conventional reproduction of recorded contents in video tapes.

However, the more the number of recorded programs increases with the increasing capacity of the recording media, the more difficult it becomes to select a desired program to reproduce. In particular, a system configured to permit program recording and recording schedule reservation automatically on the basis of user's tastes and profile information shows a tendency to record programs more than the need, for a purpose of preventing a user from being disappointed with insufficient recording. For that reason, an excessive workload is required more and more for the user to select the desired program to reproduce.

In the environment of the above recording/reproducing system when in use, the permissible amount of time for the user to practically watch videos

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recorded is considered to be negligible as compared with the total amount of time of the videos recorded. However, any effective technique or remedy to bridge a gap therebetween has not been developed yet.

5       For instance, there is provided a method of displaying a list of names, channels and broadcasting dates or the like of recorded programs on a screen. However, it doesn't always follow that the user may grasp the program contents through such a display screen.

10      Further, an attempt to display detailed information of each program also on the above display screen brings about a complication of images displayed on the screen, so that it becomes extremely difficult for the user to view the images on the screen.

15      A viewer, that is, the user does not always watch a specific television program on the air carefully. That is, the user generally assumes the style of watching television programs in such a way as to watch television for no purpose or as it happened that television is on.

20      On the other hand, an action required for the user to watch one's desired recorded program after passing judgment one after another on which is the recorded program desired to watch is not fitted for the latter watching style. In other words, the above action permits

25      no bridging of the gap between the total amount of time of videos recorded and the permissible amount of time for the user to practically watch the videos recorded.

        Most users also have an inclination to fall into such a state of mind as attaining one's feeling of

30      achievement or security with satisfaction of seeing recording of a specific broadcasting program finished,

leading to one of causes that the users may not go so far as to bring watching of the recorded program into practice. For that reason, most recorded programs are apt to remain simply recorded, that is, be kept idle

5   without a chance to be reproduced.

While the recording/reproducing system configured to permit the automation of recording and recording schedule reservation of broadcasting programs on the basis of the user's tastes and profile information has been available

10   in the prior art, manual operations are required for the user oneself for reproduction and judgment on deletion or preservation of each recorded program, inclusively of their operations. There is also the need for individual display of a recording timetable, a list of recorded

15   programs or the like, inclusively of its operation, every kind of information or operation, so that operational mistakes easily happen also in proportion as the work is complicated. To begin with, the operations in the recording/reproducing system described the above are

20   incompatible with the passive watching style of the user in such a way as to view (or watch) on-the-air programs on television for no purpose.

If the user has no intention of watching the recorded programs, it means that storage of programs

25   remaining simply recorded without being reproduced occurs so much. Consequently, as the recording capacity is approaching its limit, the user has to delete at least a part of recorded programs regardless of whether or not the user finished watching a target program for deletion.

30   For instance, a function of a type which permits the automatic deletion of time-expired programs by means of

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setting the term of validity for preservation of programs has been available until now. However, much time is required for the user to set the term of validity serially every recorded program, and besides, it is

5      difficult to set the appropriate term of validity. On the other hand, in the recording/reproducing system configured to set the term of validity, videos inclusive of important videos are in danger of deletion in user's unguarded moment and so on, so that it is extremely

10     difficult to permit the above function to reflect on management of preservation of recorded videos while grasping the user's intention accurately. Accordingly, a function which permits the efficient deletion of only unnecessary videos from a mass of automatically stored

15     recorded videos is in great demand. To select target programs for deletion from a large number of recorded programs is considered to be indivisible from, that is, essentially the same as to select which program to watch.

       On the other hand, in a recording/reproducing system

20     of sequential access mode such as video tapes, even if the user gives a pause to a certain recorded program in the process of watching, disconnection of power or switching to other recorded programs to watch brings about a loss of information of a recorded program pause

25     position. Thus, if the user desires to resume reproduction for watching from the last paused point, has the user stores a counter value for rewind operations or the like.

       When a list of recorded programs is displayed on the

30     screen in the recording date order, the user has to bring displaying of the list of recorded programs on the screen

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once into practice before selection of the desired program to reproduce. For that reason, if there is an interval of broadcasting/recording date between programs even having continuity like a series of programs

5   inclusive of a serial drama or the like, when recorded, the complicated work is required for the user to watch such the programs in due order.

## SUMMARY OF THE INVENTION

10   It is an object of the present invention to provide a recording/reproducing system, which is satisfactory to permit the automated recording and recording schedule reservation of videos of programs or the like sent on the air from broadcasting stations.

15   Another object of the present invention is to provide a recording/reproducing system, which is satisfactory to support the reproduction and watching operations of a large number of automatically recorded videos.

20   A further object of the present invention is to provide a recording/reproducing system, which is satisfactory to permit the facilitation of selection and management of recorded videos in the manner of following the operations of general AV equipment such as

25   televisions and video decks.

A still further object of the present invention is to provide a recording/reproducing system, which is satisfactory to permit the reflection on management of preservation of recorded videos while grasping user's

30   intention accurately.

The present invention is provided in view of the

above objects, and a first aspect of the present
invention relates to a system or a method of recording
and reproducing broadcasting programs received or
programmed to receive.  The recording/reproducing system
5    or method comprises a program sorting means or step of
sorting broadcasting programs into categories according
to a predetermined rule; a program recording means or
step of recording the broadcasting programs or
programming the recording thereof; a virtual channel
10   management means or step of assigning virtual channels
every category, while setting the broadcasting programs,
sorted into the categories, in array on the associated
virtual channel in the reproduction start order; a user
operation means or step of accepting user-based channel
15   select operations and/or program search operations on the
virtual channels and a program presentation means or step
of taking out the associated broadcasting program for
reproduction from the selected channel in response to the
user operations accepted through the user operation means
20   or step.

An entry of the categories of virtual channels may
be made according to user profiles and/or user
instructions.

The virtual channels may include a virtual channel
25   for an array of programs, which are not included in any
category for the failure to set the associated category
by the user.

The program sorting means or step may also be
configured to sort the broadcasting programs according to
30   EPG (Electronic Programming Guide) distributed as a part
of data for data broadcast or instructions supplied from

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each user.

The virtual channels may be configured to determine the reproduction start order of programs in accordance with a priority established on the basis of at least one of the on-the-air program order, the user profiles and the user instructions.

The virtual channel management means or step may also be configured to shift reproduction start positions on the virtual channels in the process of being selected and non-selected with the lapse of real time. Thus, since the active operations or watching pose are not required for the user to reproduce the recorded videos, the above configuration is easily acceptable to the user having a passive watching style and besides, permits reduction in number of simply recorded programs kept idle without a chance to be reproduced.

The user operation means or step may also be configured to accept program search operations such as pause, fast forward and rewind of a reproduction position on each virtual channel, or in addition, operations of specifying the preservative status of recorded programs, inclusively of deletion, preservation and reservation (for later watching) relating to specific programs on the virtual channels. In particular, the "fast forward" and "rewind" operations across a plurality of programs reproduced on the same virtual channel are also applicable.

The virtual channel management means or step may also be configured to manage the preservative status of programs set in array on the virtual channels.

The virtual channel management means or step may

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also be configured to identify each program set in array on the virtual channels as one watched by the user or not.

The virtual channel management means or step may also be configured to locate programs on the virtual channels according to the specified preservative status with respect to each recorded program.

For instance, a program identified as one watched may be located in a period of the near past on a time base on the associated virtual channel, a program identified as one programmed to delete may be located in a period of the remote past on the time base, and a program identified as one preserved may be located in a period of the slightly remote past on the time base.

The virtual channel management means or step may also be configured to locate a program, identified as one programmed to be recorded, in a period of the future on the time base (provided that a point on and after a broadcasting date is required) on the associated virtual channel, permitting the presentation of information to the effect that how later the user is allowed to reproduce the associated program. A plurality of programs, if desired to record in the same time period or overlapped in point of time with a program programmed to be reproduced earlier than the associated program, may be located on the virtual channels without an overlap in the manner of shifting these programs to a point on and after the broadcasting date.

The virtual channel management means or step may also be configured to locate a program, identified as one remaining recorded without being watched (reproduced) yet, in a period of the future spare time on the associated

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virtual channel.

The virtual channel management means or step may also be configured to locate a program, identified as one reserved, in a period of the future spare time on the

5 associated virtual channel preferentially, or alternatively locate the programs on the virtual channels for reproduction in the manner of specifying "a reservation period" for sorting the programs into periods of "near future" and "remote future" or the like, for

10 instance, according to the reservation period.

The virtual channel management means or step may also be configured to locate the already set programs in overlapped array when the period of the future spare time is not filled with the recorded programs resulting from

15 scheduling thereof, thus avoiding the absence of broadcasting programs (that is, programs for reproduction) on the virtual channels.

The virtual channel management means or step may also be configured to display a list of program schedules

20 on each virtual channel and watching and preservative status of each program in the form of being identified at a glance. For instance, display of a program list is also practicable according to the watching or preservative status or in the manner of varying color,

25 symbol and font or the like every channel.

The virtual channel management means or step may also be configured to locate a so-called series of programs in ascending order of recording dates serially on the same virtual channel. The array of programs as

30 described the above may be scheduled on the basis of program identification information and data contained in

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EPG.

The virtual channel management means or step may also be configured to shift the reproduction start position on the virtual channel, which is in the process

5    of being selected, to the period of the future or past on the time base in response to the "fast forward" or "rewind" instructions supplied through the user operation means or step.  In such a case, instructions to permit no operation of "fast forward" to the program corresponding

10   to one earlier than a scheduled date of broadcasting are also applicable.  Further, the reproduction start position on the virtual channel in the process of being non-selected may be set to follow the lapse of real time, while the reproduction start position on the virtual

15   channel in the process of being selected is shifted to the period of the future or past on the time base in response to the "fast forward" or "rewind" instructions supplied through the user operation means or step (that is, on the program list, only a line of the virtual

20   channel in the process of being selected is set to slide in response to the "fast forward" or "rewind" operation, while no slide of other virtual channel lines occurs.)

The recording/reproducing system or method according to the present invention may further comprise a real

25   channel management means or step of assigning real channels to the on-the-air broadcasting programs.  In such a case, the program presentation means or step may also be configured to take out the recorded program for reproduction from the virtual channel, selected through

30   the user operation means or step, in response to the selection of the above virtual channel, while presenting

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the on-the-air program on the real channel, selected
through the user operation means or step, in response to
the selection of the above real channel.  The user
operation means or step may also be configured to accept
5    the channel select operations requiring no distinction
between the real channels and the virtual channels.

The recording/reproducing system or method according
to the present invention may further comprise a "To Watch
list" management means or step of managing reproduction
10   information or the like relating to paused programs on
each virtual channel.  The "To Watch list" management
means or step may also be configured to start
reproduction of the associated recorded programs in
response to user selection in the manner of displaying a
15   list of paused programs to accept user selection on the
display of paused programs.  The "To Watch list" may be
placed in a non-volatile hold state for the duration of
disconnection of power from the system and may also be
set to permit deletion of a specific entry from the "To
20   Watch list" according to the explicit instructions from
the user.

According to the present invention, the recorded
videos are sorted into categories, while the virtual
channels are assigned to the categories.  Since only the
25   programs fitted for a certain specific category may be
recorded onto the virtual channels, if configured
according to the categories defined by the user, the user
oneself may estimate quite accurately what kind or
content of programs is included in which channel.
30   Further, when there is the need for sharing the
recording/reproducing system among a plurality of users

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for domestic use or the like, the virtual channels may be assigned every user.

The recorded programs are set in array on the time base on each virtual channel, permitting concurrent reproduction on each virtual channel. Provided that the virtual channels having no chance to bring watching into practice by the user are good enough to advance the reproduction start point on the occasion of channel selection with the lapse of real time, without the need for activating the process of reproducing the recorded program programmed to be reproduced at the pertinent time. Further, the above virtual channels are also good enough to calculate the reproduction start point on the occasion of channel selection, without the need for calculation point by point. The user may happen to watch various recorded programs only through the operation of switching over the channels from one to another or continuing to reproduce the recorded programs on a single channel after application of power at any time. It is to be understood that a quite passive style is sufficient for the user to watch the recorded programs.

The recording/reproducing system or method according to the present invention permits the user to watch the recorded program only through the channel switching operations, i.e., operations quite familiar to general television receivers. That is, it is not necessary for the user to learn a new operating method other than the channel switching operations, and besides, any active operation or watching pose is not required for the user to reproduce the recorded videos. Thus, the recording/reproducing system or method of the present

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invention is easily acceptable to the user having the passive watching style and also permits a reduction in number of simple recorded programs kept idle without a chance to be reproduced.

5      The present invention is applicable to a recording/reproducing system, which permits the automatic recording of videos of broadcasting programs or the like onto a high-speed random-accessible recording media such as a hard disk device.

10      The recording/reproducing system according to the present invention may present recorded videos to the user effectively and simply, permitting the user to watch one's desired videos efficiently.

The recording/reproducing system according to the present invention also permits the selection and other management of recorded videos by intuition in combination with well-experienced operations, which are familiar to the user, of AV equipment such as televisions and video decks (inclusive of operations of channel switching, fast forward, rewind and playback from the top and so on).

BRIEF DESCRIPTION OF THE DRAWINGS

The foregoing and other objects and features of the invention will become apparent from the following description of preferred embodiments of the invention with reference to the accompanying drawings, in which:

Fig. 1 schematically illustrates the hardware configuration of a recording/reproducing system 10 according to an embodiment of the present invention;

Fig. 2 is a view showing the configuration of a user operation panel of a remote controller 60 or a user

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interface (U/I) control unit 56 applied to the embodiment of the present invention;

Fig. 3 schematically illustrates the configuration of a program table in the recording/reproducing system 10 according to the embodiment of the present invention;

Fig. 4 is a view showing arrays of recorded contents on associated virtual channels assigned every category;

Fig. 5 is a view showing the channel switching operation required for a user on the program table shown in Fig. 3;

Fig. 6 is a view showing "fast forward" or "rewind" operation applied to a virtual channel, which is now in the process of reproduction, to permit a user to watch programs before and behind the associated program;

Fig. 7 is a view showing the "fast forward" operation in a certain specific virtual channel (News) for the duration of display of a screen for a list of scheduling of programs to reproduce;

Fig. 8 is a view showing a timetable describing the array of programs, that is, the program reproduction order in a certain virtual channel;

Fig. 9 is a view showing a virtual channel scheduling method, when applied to a case where a plurality of programs to be included in the same virtual channel are sent on the air in the same time period;

Fig. 10 is a view showing a "To Watch list" displayed on a display screen;

Fig. 11 is a flow chart showing a procedure of assigning program contents recorded through automatic or manual operations and program contents programmed to be recorded in the future to virtual channels according to

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the recording/reproducing system 10;

Fig. 12 is a flow chart showing a procedure of scheduling in each virtual channel;

Fig. 13 is a flow chart showing a procedure of locating scheduling units in a schedule table of the virtual channels;

Fig. 14 is a view showing a schedule list in each virtual channel, together with components of the list;

Fig. 15 is a flow chart showing a procedure of specifying a video to be now reproduced on the basis of a schedule table;

Fig. 16 is a view showing components of Scheduling Unit;

Fig. 17 is a view showing components of Play Unit;

Fig. 18 is a view showing the configuration of program information "TVContent";

Fig. 19 is a view schematically showing a flow of data in a case of generating Scheduling Unit on the basis of "TVContent";

Fig. 20 is a view schematically showing a flow of data in a case of generating Play Unit on the basis of Scheduling Unit;

Fig. 21 is a view showing "To Watch Entry" components added to a "To Watch List"; and

Fig. 22 is a view showing the procedure of receiving programs of real channels, together with the procedure of reproducing programs in virtual channels in the recording/reproducing system 10 according to the embodiment of the present invention.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

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Fig. 1 schematically illustrates the hardware configuration of a recording/reproducing system 10 according to an embodiment of the present invention.

The recording/reproducing system 10 according to the
5 embodiment of the present invention provides services of retrieval and presentation of recorded contents for a user, in addition to services of recording of broadcasting programs (broadcast contents) sent on the air hourly from broadcasting stations. In particular,
10 one of the features of the recording/reproducing system 10 is a mass storage capacity enough to permit the recording of numerous videos and also the reflection on management of preservation of recorded videos while grasping user's intention accurately (which will be
15 described later). The recording/reproducing system 10 may be packaged as AV equipment in such a way as to be integrated with a television receiver such as STB (Set Top Box), for instance.

The recording/reproducing system 10 comprises a CPU
20 (Central Processing Unit) 11 as a main controller connected to each hardware component through a bus 50 for execution of overall control of the components. A description will now be given of each component of the recording/reproducing system 10.
25 A broadcast wave received by an antenna (not shown) is supplied to a tuner 51. The broadcast wave conforms to a predetermined format and may include program guide information (EPG: Electric Program Guide) or the like, for instance. It doesn't matter particularly whether the
30 broadcast wave is referred to ground or satellite wave and is for wire or radio broadcasting service.

The tuner 51 outputs reception data to a succeeding
demodulator 52 after tuning, that is, channel selection
of the broadcast wave of a predetermined channel
according to the instructions from the CPU 11. The
5    demodulator 52 demodulates digitally modulated reception
data. Incidentally, the configuration of the tuner 51
may be altered or extended appropriately depending on
whether transmitted broadcast wave is referred to analog
or digital broadcast wave.

10   In a case of digital satellite broadcasting service,
for instance, digital data received and demodulated from
the broadcast wave is considered to be "transport stream"
configured by multiplexing AV data compressed in a mode
of MPEG2 (Moving Picture Experts Group 2) and data for
15   data broadcast together. The AV data in the former is
referred to video and audio information configuring a
broadcast content body. On the other hand, the data for
data broadcast in the latter is referred to data annexed
to the broadcast content body and includes EPG (Electric
20   Program Guide), for instance. Incidentally, the
transport stream is regulated with "transport layer"
referred to in an OSI (Open Systems Interconnection)
reference model.

A decoder 53 separates the transport stream into AV
25   data compressed in the mode of MPEG2 and data for data
broadcast after interpretation of the transport stream
and further separates real-time AV data compressed in the
mode of MPEG2 into compressed video data and compressed
audio data. Then, the decoder 53 expands the video data
30   in the mode of MPEG2 to reproduce an original video
signal, while combining the audio data with additional

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sound after PCM (Pulse Code Modulation) decoding of the audio data to provide a reproduced audio signal. The decoder 53 may include a memory 54 for storage of work data as its own local memory. The reproduced video

5  signal is outputted from the decoder to a display 61 through a composer 57. On the other hand, the reproduced audio signal is outputted from the decoder to a speaker 62 through a mixer 55.

The decoder 53 transfers the data for data broadcast,

10  separated from the transport stream, to the CPU 11 via the bus 50. The CPU 11 conducts the processing of the data for data broadcast according to predetermined application, and the resultant data may be applied to creation of an EPG screen or the like.

15  The decoder 53 may also transfer MPEG2 stream before being subjected to expansion to the CPU 11 or other equipment (HDD 17 or the like, for instance) via the bus 50 in response to a request from the CPU 11.

A user interface control unit 56 is referred to a

20  module for processing user input operations and has functions of accepting remote operations from a remote controller 60 through a manual-operation button/switch (not shown) operated directly by the user and infrared radiation (IR) or the like. The user interface control

25  unit 56 may also include a display panel and an LED indicator (not shown) for displaying current set-contents.

The CPU 11 is referred to a main controller for generalizing the whole operations of the content recording/reproducing system 10 and permits the execution

30  of various applications on a platform provided by OS (Operating System).

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RAM (Random Access Memory) 12 is a write-enable volatile memory used for loading of execution program codes of the CPU 11 or writing of work data of an execution program. ROM (Read Only Memory) 13 is a read-only memory for storing permanently a self-diagnostic/initialization program required in application of power to the content recording/reproducing system 10, together with control codes for hardware operations or the like.

IEEE1394 (i-Link) interface 15 is referred to a serial high-speed interface, which permits the interchange of data of about several ten MBps. External equipment associated with IEEE1394 may be connected in a daisy chain or in a tree to an IEEE1394 port. The equipment associated with IEEE1394 may include a video camera 64, a video deck and a scanner (not shown) or the like, for instance.

The HDD (Hard Disk Device) 17 is referred to a random-accessible external storage device, which permits the storage of programs and data or the like in a predetermined file format and has a capacity as large as about several ten GB (or 100 GB or more), for instance. A hard disk storage space is managed by the operating system, for instance. The HDD 17 is connected to the bus 50 through a hard disk interface 16. In the embodiment of the present invention, the HDD 17 is used as a recording area of the broadcast contents and is also applicable to storage of information such as a user profile and a timetable. Although such a large-capacity external storage device is not limited to the hard disk device, it is more preferable for implementation of the

present invention to use a hard disk device which is random-accessible.

The CPU 11 permits the execution of various applications under control of the OS (Operation System).

5      The CPU 11 issues instructions to record or reproduce contents in response to user commands supplied through the remote controller 60 and the user interface (U/I) control unit 56, for instance (or may perform the recording operations at all times irrespectively of the

10     presence or absence of explicit user commands).

In recording operations, the MPEG2 stream before being subjected to expansion is transferred from the decoder 53 to the HDD 17 according to the instructions from the CPU 11.  A data transfer mode is not

15     particularly limited and PIO (Program IO), DMA (Direct Memory Access) or like may be employed.  Each broadcast content is stored in the HDD 17 in time series every virtual channel.  Incidentally, how to store the contents will be described later.

20     In reproducing the recorded contents, the MPEG2 stream taken out from the HDD 17 is transferred to the decoder 53 through the bus 50 according to the instructions from the CPU 11.  Similarly to the processing in reception, the decoder 53 separates the

25     MPEG2 stream into the compressed video data and the compressed audio data, which are then restored to original video and audio data through MPEG2 expansion for reproduction.

The following processing is required for the CPU 11,

30     in addition to issuance of instructions to record and reproduce the broadcast contents.

(1) Analysis and management of user profile

To store the user profile supplied through an operation panel (or a keyboard) or the user profile read from a recording media such as FD and CD, or to analyze

5 the user profile such as user's hobbies and tastes for successive updating on the basis of a history of channel operations, for instance.

(2) EPG analysis

To take out the EPG (Electronic Program Guide)

10 contained in the data for data broadcast distributed together with the broadcast contents in the digital satellite broadcasting service, for instance, and to analyze the EPG.

(3) Program scheduling

15 To make a schedule for recording and reproduction suited for the user on the basis of the user profile, the result of EPG analysis and time information. The schedule thus obtained is stored in the HDD 17 as a timetable in the recording/reproducing system 10

20 according to the embodiment of the present invention.

A graphic processing controller 18 is referred to a controller dedicated to generation of a computer screen according to graphic commands issued from the CPU 11 and has a graphic performance equivalent to SVGA (Super Video

25 Graphic Array) or XGA (Extended Graphic Array), for instance. The graphic processing controller 18 generates a GUI (Graphical User Interface) operation screen and an EPG screen, for instance.

The composite processing is performed by the

30 composer 57 for superposition of a reproduced video, restored by the decoder 53 through MPEG2 expansion, with

a computer image, generated by the graphic processing controller 18, if needed.

In the recording/reproducing system 10 according to the embodiment of the present invention, the recorded videos are sorted into categories, and "virtual channels" are assigned to the categories. The categories referred to in this embodiment are determined by genre of the program contents such as "News", "Sports & Leisure" and "Drama & Documentary", for instance. The contents are set in array on a real or virtual time base on each virtual channel. Thus, the recording/reproducing system 10, when sets each virtual channel is set in a direction of vertical line and the time base is set in a direction of horizontal line, makes it possible to assign each recorded content on a two-dimensional plane. In other words, addressing of positions in two directions, i.e., vertical and horizontal directions, makes it possible to specify desired recorded contents.

Fig. 2 shows the configuration of a user operation panel of the remote controller 60 or the user interface (U/I) control unit 56 applied to the embodiment of the present invention.

As shown in Fig. 2, numeral keys assigned for select operations of channels are placed on the operation panel, together with cursor keys assigned for upward, downward, leftward and rightward cursor moves.

The channels assigned by the numeral keys may include virtual channels configured by the contents stored in the HDD 17, in addition to channels for broadcast programs sent on the air from the real broadcasting stations. Thus, the user may watch the

programs in the virtual channels, that is, may give an instruction to reproduce the contents from the HDD 17 through the operations equivalent to the ordinary channel selection.

5    The numeral keys unavailable for the real broadcast channels are preferably assigned for virtual channel operations. 15 pieces of numeral keys 1 to 15 in total are used for the embodiment shown in Fig. 2. The channel numbers 13 to 15, if not assigned to the real channels

10   representing the real broadcasting stations, for instance, are considered to be spare channel numbers, which may be applied to assignment to the virtual channels.

The cursor keys include upward, downward, leftward and rightward cursor keys, which are placed at upper,

15   lower, left and right locations substantially about a central home position. Thus, the user, if puts the tip of finger on the home position in advance, may detect a desired-direction cursor key with the tip of finger for key operations without the need for watching the

20   operation panel in particular (that is, without raising one's eyes from the TV screen).

In general, the upward or downward (+ or -) cursor key on a remote controller or a Set Top Box, when touched, permits the channel number to be incremented or

25   decremented one by one for channel selection. On the assumption that the channel number 12 is selected in the content recording/reproducing system 10, for instance, every time the upward (+) cursor key is once touched, the successive transition of the channel occurs in the order

30   of the channel numbers 13, 14 and 15. Touching one more the upward cursor key may restore the channel to the

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channel number 1.

The program contents on the virtual channels are recorded in a random-accessible device such as the HDD 17, permitting start of reproduction at a desired speed from

5   a desired storage location.  Thus, various watching modes such as " fast forward", "rewind", "slow motion" and "scene jump" are applicable to the virtual channels.

The operation panel having the upward, downward leftward and rightward cursor keys as shown in Fig. 2,

10   when in use, permits the assignment of leftward and rightward cursor move operations to the time base.  For instance, the leftward cursor key may be assigned for an access to a program right before the associated program in the virtual channel, while the rightward cursor key

15   may be assigned for an access to a program right behind the associated program in the virtual channel.  Further, touching each of these cursor keys longer (that is, continuing to touch each key for a predetermined period of time or more) may cause a jump largely forward or

20   rearward.

Fig. 3 schematically illustrates the configuration of a program table in the recording/reproducing system 10 according to the embodiment of the present invention.  In the embodiment shown in Fig. 3, each channel is assigned

25   in a direction of vertical line, while the time base is assigned in a direction of horizontal line, and this program table assumes the shape of a kind of timetable.

Real channels for programs sent on the air practically and virtual channels set every category are

30   assigned to the channels.  In the embodiment shown in Fig. 3, "TV Japon" is shown as the real channel, while the

virtual channels are assigned to categories such as
"News", "Sports & Leisure" and "Drama & Documentary".
Further, when there is the need for sharing the
recording/reproducing system among a plurality of users
5   for domestic use or the like, the virtual channels may be
assigned every user.

An analysis of EPG distributed as the data for data
broadcast, for instance, may be applied to edition of
scheduling on the real channel. On the other hand, the
10  recorded contents sorted into the associated categories
are assigned in time-series, that is, in the reproduction
start order for scheduling on the virtual channels. The
recorded contents in each virtual channel are set in
array in accordance with a priority established properly
15  on the basis of the user profile or the like on the
system 10.

The start and end times of the programs on the real
channel are in conformity with instructions on the
broadcasting station side. On the other hand, the start
20  and end times of the programs on the virtual channels are
not always necessary to conform to a breakpoint such as a
period exactly every hour, quarter, half an hour and so
on.

Fig. 4 shows arrays of recorded contents on the
25  associated virtual channels assigned every category.

The categories may be set through user-based
selection from a list of preliminarily defined categories
(setting of a plurality of categories is applicable) or
through automatic selection on the basis of the user
30  profile. Otherwise, assignment of the virtual channels
every user is also applicable.

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A virtual channel "Others" at the final stage shown in Fig. 4 is for accommodation of programs which are not included in any category for the failure to set the associated category by the user.

Fig. 5 depicts the channel switching operation required for the user on the timetable shown in Fig. 3. The channel switching operation may be made by touching the key of a desired channel number or the upward or downward cursor key on the operation panel shown in Fig. 2, for instance.

In the embodiment shown in Fig. 5, it is assumed that the viewer, that is, the user is placed in a situation of now watching a program titled "NNNN Flash" on the virtual channel assigned to the category of "News".

The user may watch the programs of different channels in sequence through the channel switching operation with the remote controller 60 or the like. While the channel at the uppermost stage in Fig. 5 represents the real channel called "TV Japon" now on the air, switching of the real channel to the virtual channels is practicable continuously without distinction between the real channel and the virtual channels. For instance, the downward cursor key of the remote controller 60, if continued to touch down, switches over the channels in the order of programs titled "NNNN Flash", "Baseball Y vs B", "Animal World " … and "Quiz $ & ?".

The time base is advancing independently on each virtual channel even for the period of time when the other channels are being selected. For instance, when the user switches over the real channel called "TV Japon" on the air to the other virtual channels after continuing

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to watch the program on the above real channel until the real time reaches 20:00, the programs titled "CNN midnight", "Baseball A vs T" and "24 hours" are in the process of being reproduced on the virtual channels.

The advance of time on the virtual channels is also applicable for the duration of not only application of power to the system 10 but also disconnection of power or standby.  This may be by synchronization of a system clock with the schedule on a certain virtual channel when selected.  (The virtual channels having no chance to bring watching into practice by the user are good enough to advance the reproduction start point on the occasion of channel selection with the lapse of real time without the need for activating a process of reproducing a recorded program programmed to be reproduced at the pertinent time.  The above virtual channels are also good enough to calculate the reproduction start point on the occasion of channel selection, without the need for calculation point by point.)

A concept of the lapse of time on the virtual channels used for reproduction of the recorded contents, when introduced, is easily accepted to the user having a passive watching style and besides, permits a reduction in number of simply recorded programs kept idle without a chance to be reproduced.

The recorded videos to be reproduced on the virtual channels are stored in the high-speed random-accessible recording media such as the HDD, permitting an access to the desired reproduction start point at high speed through the fast forward or rewind operation.  The fast forward or rewind operation is instructed by touching

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each of the leftward and rightward cursor keys on the operation panel shown in Fig. 2, for instance.

Fig. 6 shows the "fast forward" (FF) and "rewind" (RW) operations applied to a virtual channel, which is now in the process of reproduction, that is, in the process of being watched, to watch a program before and behind the associated program.

In the embodiment of the present invention, the "fast forward" and "rewind" operations applied to a certain virtual channel have no effect on the advance of time on the other virtual channels. For instance, as shown in Fig. 6, on the assumption that the virtual channel assigned to the category of "News" is being selected, the "fast forward" or "rewind" operation, if applied to the selected virtual channel, permits an access to the recorded program contents before and behind the associated program on the selected virtual channel, while no access of the recorded contents occurs on the other virtual channels. That is, "Baseball Y vs B" remains reproduced on the virtual channel assigned to the category of "Sports & Leisure", while "African Romance" remains reproduced on the virtual channel assigned to the category of "Drama & Documentary".

Fig. 7 depicts the manner of the fast forward operation applied to a certain specific virtual channel assigned to the category of "News", while a list of scheduling of programs to reproduce is being displayed on the screen.

As shown in Fig. 7, it is understood easily visually that the time base (i.e., a reproduction schedule) is being advanced in the certain virtual channel through the

"fast forward" operation for sliding the list of programs
to the left. Provided that it is an important
consideration that the above "fast forward" operation has
no effect on the other virtual channels, to which no
5    "fast forward" operation is applied, resulting in no
advance of the time base. The same may be applied to the
rewind operation.

Fig. 8 illustrates the timetable describing the
array of programs, that is, the reproduction order of
10   programs in a certain virtual channel assigned to the
category of "Drama & Documentary".

As shown in Fig. 8, the timetable constitutes a time
base composed of a current position "Now", a time period
of "Past" on the left side of "Now" and a time period of
15   "Future" on the right side of "Now".

In the time period of "Past", a program identified
as one programmed to be deleted soon (i.e., "World War I
in the embodiment shown) is located in a period of the
remote past on the time base. Then, a preserved program
20   (i.e., "Girls and Boys") and a program identified as one
watched (i.e., "Sea Life") are located in this order.

In the timetable shown in Fig. 8, the reproduction
times on the reproduction schedule are set in array in
the order, which is from most to least past, on the
25   reproduction schedule basically, permitting the user to
search by intuition a desired program in the virtual
channels in such a way as to require a slight rewind
operation for searching a recently watched program and a
more "rewind" operation for searching a more previously
30   watched program.

On the other hand, programs identified as one

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programmed to be reproduced in future are located on the virtual channel in the time period of "Future" on the timetable according to the reproduction schedule order. In the embodiment shown in Fig. 8, the programs

5 identified as one programmed to be reproduced in future are located in the order of "African Romance", "24 Hours" and "Rescue Help Me!".

Incidentally, the recorded programs located on the timetable may be sorted by color for display according to

10 a difference from the time to reproduce. Thus, the status of programs to be reproduced may be identified at sight in such a way as to display a program, identified as one programmed to be deleted soon, dark (or light) or a program, identified as one programmed to be reproduced

15 in future, bright or highlighted.

On the other hand, the real channel is referred to a channel for receiving the programs sent on the air from the real broadcasting station, and a plurality of real channels are considered to be available. Further, the

20 contents of the programs sent on the air from the broadcasting station basically have no relation to assignment of the virtual channels on the recording/reproducing system 10, that is, the categories of the programs. Thus, it is often that two or more

25 programs to be assigned to the same virtual channel would be sent on the air from different broadcasting stations, that is, in the same time period on the real channels.

Fig. 9 shows a method of scheduling the programs on a certain virtual channel when a plurality of programs to

30 be included in the same virtual channel is sent on the air in the same time period.

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In the embodiment shown in Fig. 9, it is assumed that programs titled "Soccer P vs V" and "Go Fishing" to be included in the virtual channel assigned to the category of "Sports & Leisure" are on the air

5   simultaneously from 19:00 on both the real channels of "TV Japon " and "MHK".

In this case, the recording/reproducing system 10, although starts recording of both the programs from 19:00, is configured to reproduce one program titled "Go

10  Fishing" earlier in the virtual channel assigned to the category of "Sports & Leisure". In this place, if the end time of the last program titled "Baseball Y vs B" on the associated virtual channel is supposed to exceed 19:00, the reproduction start time of "Go Fishing" would

15  be later to that extent. Then, the program titled "Succor P vs V" is set to start reproduction (or the reproduction start time is set) after the completion of reproduction of the program titled "Go Fishing".

Incidentally, when a plurality of programs to be

20  included in the same virtual channel is on the air in the same time period, which program should be started to reproduce at first, that is, the program reproduction order may be set according to a default value or a priority established on the basis of the user profile.

25  Since the recorded videos to be reproduced on the virtual channels are stored in the high-speed random-accessible recording media such as the HDD 17, "pause" is also applicable, similarly to the "fast forward" and "rewind" operations. The recording/reproducing system 10

30  according to the embodiment of the present invention is configured to display a list of paused programs, that is,

a "To Watch list" on the display 61 for providing user feedback.

Fig. 10 shows the "To Watch list" displayed on the display screen. The "To Watch list" displayed in Fig. 10

5   represents that a program titled "XYZ morning" of a duration time of 44 minutes 35 seconds as a whole is now paused in a point 13 minutes 22 seconds past its forefront point, and also that a program titled "Animal World" of a duration time of 55 minutes as a whole is now

10  paused in a point 42 minutes 02 seconds past its forefront point.

The user may resume reproduction in the manner of selecting any one of entries from the "To Watch list" to release the recorded program from its paused state. In

15  this place, immediate reproduction is practicable irrespectively of how to schedule the programs in which virtual channel for reproduction at what time. In resuming the reproduction in this manner, schedules of the programs in any virtual channel remain unchanged.

20  The "To Watch list" may be implemented by operating a stop position of a program in each virtual channel in the CPU 11, then generating a display window in the graphic processing controller 18 and superposing the generated window image on the on-the-air or reproduced

25  program videos for display in the composer 57.

The user may provide "Evaluation by user oneself" for a program, which is now being watched, through the operation panel of the remote controller 60 or the like. That is, buttons (or input means equivalent to the

30  buttons) corresponding to "Delete", "Watched", "Preserve", "Reserve" and "Cancel of evaluation" are provided on the

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operation panel to permit the user to give instructions at all times. As a matter of course, the recording/reproducing system 10 may be configured to delete automatically a recorded program having no chance

5 to bring watching into practice for a long time, (that is, kept idle) or identify a program reproduced abnormally for a certain period of time as one watched. Also, the user-based direct evaluation may be used in combination with the automatic evaluation based on the

10 recording/reproducing system 10.

Fig. 11 shows a flow chart of the procedure of assigning the program contents recorded through the automatic or manual operations on the recording/reproducing system 10 and the program contents

15 programmed to record in the future to the virtual channels. A description will now be given of the above procedure with reference to this flow chart.

Firstly, as set-up operations, data called "SU" (Scheduling Unit) serving as units of scheduling is

20 created for programs (Step S1). The SU has components as shown in Fig. 16 and may be created on the basis of program information "TVcontent" as shown in Fig. 18 (which will be described later.). The procedure of generating "TVcontent" and the procedure of generating

25 "Scheduling Unit" on the basis of "TVcontent" will be described later.

As another set-up operations, a variable "isAdded" is set to "false", and "channel" representing a current channel number is initialized to 1 to set the total

30 number of virtual channels (six, for instance) for a variable "maxChannels".

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Subsequently, the current channel number "channel" is compared with the variable "maxChannels" (Step S2). When the former is smaller than the latter, the processing is advanced to Step S3. On the other hand, 5 when being larger, the processing is advanced to Step S8.

In Step S3, it is decided whether or not a category remains yet in the current virtual channel represented by "channel". When the result of decision is YES, the processing is advanced to Step S4. On the other hand, 10 when the result of decision is NO, the processing is advanced to Step S7.

In Step S4, the next category of the virtual channel in the process of being now selected is substituted for a variable "cat". Then, in Step S5, it is decided whether 15 or not "categories" of SU contains the variable "cat". When the result of decision is YES, the processing is advanced to Step S6. On the other hand, when the result of decision is NO, the processing is advanced to Step S7.

The variable "channel" is incremented by 1 in Step 20 S7, before the processing is returned to Step S2 to repeat the similar processing to that described the above.

With the above processing, Steps S2 to S6 are supposed to be executed with respect to all the virtual channels except for the last virtual channel. At this 25 point of time, it is decided whether or not the variable "isAdded" is true (Step S8). When the result of decision is YES, SU is considered to be added to any virtual channel, and therefore, the recording/reproducing system 10 brings the whole routine of the present processing to 30 end.

On the other hand, when the variable "isAdded" is

judged to be false, the processing is advanced to Step S9.
Since it is ascertained that no SU is added to any
virtual channels, addition of SU to the last (i.e.,
"maxChannel"-th) virtual channel is required in Step S9
before the system 10 brings the whole routine of the
present processing to end.  The last virtual channel is
referred to a channel reserved by the system 10 for
storing programs, which are not matched with any virtual
channels assigned to the categories specified by the user.

Incidentally, after addition of SU to the virtual
channel in Step S6, repetition of the processing in Steps
S2 to S6 is required on and after the next virtual
channel, so that the same SU often matches a plurality of
virtual channels.  The processing of creating "Duplicate
of SU" for addition to the virtual channel in Step S6 is
for treating SU (corresponding to the same program) added
to the different virtual channels as independent SU.

The routine of processing shown in Fig. 11 makes it
possible to determine the virtual channel including a
certain recorded program (or a program identified as one
programmed to be recorded).  A description will now be
given of the procedure of scheduling in each virtual
channel with reference to the flow chart shown in Fig. 12.

As set-up operations, "scheduling Unit" of a program
added to the associated virtual channel is set for the
variable "SU" (Step S11).

In the following processing, addition of SU to the
corresponding list is required successively on the basis
of "Status" of "Scheduling Unit" (Refer to Fig. 16).

In Step S12, it is decided whether or not SU is
programmed to be deleted.  When the result of decision is

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YES, addition of SU to a deletion schedule list in ascending order is required (Step S18) before the system 10 brings the routine of the present processing to end.

In Step S13, it is decided whether or not SU was preserved. When the result of decision is YES, addition of SU to a preservation list is required (Step S19) before the system 10 brings the routine of the present processing to end.

In Step S14, it is decided whether or not SU has been watched. When the result of decision is YES, addition of SU to a watched program list is required (Step S20) before the system 10 brings the routine of the present processing to end.

In Step S15, it is decided whether or not SU is programmed to be recorded. When the result of decision is YES, addition of SU to a recording schedule list is required (Step S21) before the system 10 brings the routine of the present processing to end.

In Step S16, it is decided whether or not SU is in the process of reservation. When the result of decision is YES, addition of SU to an in-reservation list is required (Step S22) before the system 10 brings the routine of the present processing to end.

In Step S17, it is decided whether or not SU is watching (reproduction)-enable data. When the result of decision is YES, addition of SU to a reproduction-enable data list is required (Step S23) before the system 10 brings the routine of the present processing to end.

All the above lists are not always required. As a matter of course, "the preservation list" and "the in-reservation list" or the like, for instance, may be

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omitted, if not needed as functions.

A description will now be given of the procedure of locating each sorted SU in the schedule table of the associated virtual channel with reference to the flow chart shown in Fig. 13.

As set-up operations, a list "allEntries" for storing SU contained in the associated virtual channel in time-series array is cleared, and a base time "baseTime" of the schedule table (that is, a time to start reproduction of SU in the forefront) and the total schedule length "totalLength" are set to initialize a current schedule time "curTime" to zero (Step S31).

Subsequently, components in the deletion schedule list are added from the top to the list "allEntries" (Step S32). In a case of addition, there is the need for setting "curTime" for "startTime" of the component SU to add "durationTime" of SU to "curTime".

Subsequently, components in the watched program list are added from the top in sequence to the list "allEntries" (Step S33). In a case of addition, there is also the need for setting "curTime" for "startTime" of the component SU to add "durationTime" of SU to "curTime", similarly to Step S32.

The above processing is considered to be fitted for a group of Scheduling Units located in the time period of "Past" on the time base of the associated virtual channel. On the other hand, the following processing is required for scheduling in "Future". Incidentally, the embodiment shown in Fig. 13 has no description of addition of components in the preservation list for the reason that the processing contents are substantially similar to

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those in Steps S32 and S33.

In Step S34, candidates for "Scheduling Unit" located in the time period of "Future" on the time base are selected from the reproduction-enable data list and

5 the in-reservation list to add the selected candidates to a candidate list in descending order of priorities. The processing in Step S34 may be, for instance, by a method of selecting only a portion of programs having been on the air within recent 24 hours as candidates from the

10 reproduction-enable data list, or selecting the components in the in-reservation list as candidates preferentially. However, since the whole schedule length is limited, all components in the candidate list are not always scheduled.

15 Subsequently, in Step S35, it is decided whether or not the candidate list is empty of candidates. When the result of decision is YES, the processing is advanced to Step S39. On the other hand, the result of decision is NO, the processing is advanced to Step S36.

20 In Step S39, the components in the recording schedule list are added to the last of "allEntries" in the recording start time order. In case of addition, there is the need for setting "startTime" of the component SU to be ""startTime" = (Recording start time -

25 baseTime) (that is, a relative time from baseTime). An overlap of a plurality of SUs in point of time, if occurs, may be prevented by shifting any of overlapped SUs behind to change "startTime". It is not necessary to add any components of the recording schedule list, if being empty.

30 On the other hand, in Step S36, it is decided whether or not the recording schedule list is empty.

When the result of decision is YES, the processing is
advanced to Step S40. On the other hand, when the result
of decision is NO, the processing is advanced to Step S37.

In Step S40, components in the candidate list of
"Scheduling Units" to be located in the time period of
"Future" on the time base are added to the last of
"allEntries" in sequence. In a case of addition, there
is the need for setting "curTime" for "startTime" of the
component SU to add "durationTime" of SU to "curTime".
When "curTime" does not reach "totalLength", repetitive
addition of component SU in the candidate list to the
last of "allEntries" is required again. In this case,
addition of "duplicate" SU' of components is also
required. The above components may be added in the same
or different order as or from the previously described
order. In a case of addition, there is the need for
setting "curTime" for "startTime" of SU' to add
"durationTime" of SU' to "curTime" for repetitive
addition until "curTime" exceeds "totalLength". The
reason for the need of "duplicate" SU' is because SU,
although being associated with the same program, is
different in contents such as "startTime".

On the other hand, in Step S37, components in the
recording schedule list are added to the last of
"allEntries" in the recording start time order. In a
case of addition, there is the need for setting
"startTime" of the component SU to be "startTime" =
(Recording start time - "baseTime") (that is, a relative
time from "baseTime"). An overlap of a plurality of SUs
in point of time, if occurs, may be prevented by shifting
any of SUs behind to change "startTime". As a result,

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the components in the recording schedule list may be
located in time-series between "curTime" and
"totalLength".

Subsequently, in Step S38, the components in the
candidate list are inserted sequentially into a gap
between already located SUs.  If the components are too
much to be received in the gap, the already located SUs
subsequent to the associated SU are set to shift behind
before insertion.  In a case of insertion and shifting,
there is the need for setting "startTime" of the
associated SU to appropriately update "curTime" so as to
represent the start position of the next gap.  The
repetitive processing is required for the above updating
until "curTime" exceeds "totalLength", that is, the
schedule table is filled with "Scheduling Units".

A time-series list of "Scheduling Units" is
generated through the above processing.  Fig. 14 shows
the configuration of "Scheduling Unit".  "Scheduling
Unit" is referred to a time-series list, which is
considered to be equivalent to the program reproduction
schedule table of the associated virtual channel.  The
time-series list is configured closely to be free from
any over lap in point of time, permitting continuous
reproduction of a plurality of programs.  The "fast
forward" and "rewind" operations across a plurality of
programs may be also easily practicable.

A description will now be given of the procedure of
specifying a target video for reproduction at present on
the basis of the schedule table generated by the above
processing with reference to Fig. 15.

As set-up operations, the associated virtual channel

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base time "baseTime" is subtracted from the current time "curTime" to find a relative time "offsetTime" in the virtual channel (Step S51). A variable "lastSU" is also initialized to null.

5      Subsequently, it is decided whether or not the next component is contained in "allEntries" of the associated virtual channel (Step S52). When the result of decision is YES, the processing is advanced to Step S53. On the other hand, when the result of decision is NO, the

10    processing is advanced to Step S56.

In Step S53, the next component of "allEntries" is substituted for a variable "su". Then, in Step S54, "su.startTime" is compared with "offsetTime". When the former is larger than the latter, the processing is

15    advanced to Step S47. On the other hand, when being smaller, the processing is advanced to Step S55.

In Step S55, "su" is substituted for "lastSU", before the processing is restored to Step S52 to repeat the above processing with respect to the next component

20    of "allEntries".

When it is ascertained in Step S52 that the next component is not found in "allEntries", the processing is advanced to Step S56 to decide whether the last time of "lastSU" (lastSu + lastSu.duration time) is larger than

25    "offsetTime" on condition that "lastSU" is not equal to null. When the result of decision is YES, the processing is advanced to Step S57. On the other hand, when the result of decision is NO, the processing is advanced to Step S59.

30    When it is ascertained that the result of decision in Step S56 is YES, "lastSU" is considered to be

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equivalent to the current program, permitting creation of "playUnit" on the basis of program information shown by "source" of "lastSU" in Step S57.

In Step S58, substitution of a time difference (=offsetTime - last SU.startTime) from "lastSU.startTime" to the current time for "currentPosition" of "playUnit" is required before the system 10 brings the whole routine of the present processing to end.

On the other hand, when it is ascertained that the result of decision in Step S56 is NO, "lastSU" is considered to be not equivalent to any program.  Thus, generation of an empty "playUnit" is required in Step S59 before the system 10 brings the whole routine of the present processing to end.  In such a case, no reproduction occurs on the virtual channel, while no display also occurs on the display 61.

When "playUnit" generated in this manner is taken out, the processing for reproduction and display is started from "currentPosition" of "playUnit".  This is referred to the function of a general video player.

Incidentally, although not described in the above embodiment, the above procedure may also be applied to a case of requiring the "fast forward" and "rewind" operations in the manner of accumulating a time difference resulting from the "fast forward" and "rewind" operations in a variable referred to "shiftTime" to thereby subtract "shiftTime" from "baseTime" in a case of finding "offsetTime" in Step S51.  That is, "offsetTime" as shown by the following expression (1) is good enough for use.

offsetTime = CurTime - (baseTime - shiftTime)     ...(1)

Fig. 22 illustrates the procedure of receiving programs in the real channels, together with the procedure of reproduction of programs in the virtual channels in the recording/reproducing system 10 according

5    to the embodiment of the present invention. A description will now be given mainly of the procedure of reproduction of programs in the virtual channels.

(1) The user operates the operation panel of the remote controller 60 or the like for the channel switching

10   operation.

(2) The recording/reproducing system 10 provides a current time and a channel number (channel #) to a virtual channel manager in response to the channel switching operation.

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(3) The virtual channel manager creates "playUnit", which may be set as a return value for the system 10, according to "the procedure of specifying the target video for reproduction at present on the basis of the

20   schedule table" described the above (Refer to Fig. 15).

(4) The system 10 transfers "playUnit" to the video player.

(5) The video player reproduces the video on the basis

25   of "playUnit" information for display onto the screen of the display 61.

Incidentally, in Fig. 22, the virtual channel manager, a real channel manager and a "To Watch list" manager may be supposed to be substantially programs

30   executed by the CPU 11 in the recording/reproducing system 10. Also, "TV content recorder" and "Video

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player" may be brought into practice in the form referred to recording/reproducing functions of storing or taking out the TV contents in or from the HDD 17 according to the instructions from the CPU 11.

Fig. 16 shows the configuration of "Scheduling Unit". "Scheduling Unit" is a collection of scheduling information for programs recorded or programmed to record and includes at least the following components as shown in Fig. 16.

(1) startTime:

Reproduction start time in the schedule table:

(2) durationTime

Length of program:

(3) status:

Status (inclusive of status of program contents programmed to delete, watched, programmed to record, in process of reservation and enabling reproduction):

(4) title:

Title of program (for use in display of a schedule list):

(5) categories:

Categories of programs (Setting of a plurality of categories is applicable):

(6) source:

Program constituting a source of the associated scheduling:

Fig. 17 shows the configuration of "Play Unit". "Play Unit" is a collection of information for reproduction of a certain program and includes at least the following components as shown in Fig. 17.

(1) media:

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Recorded video data; Absence of this data may occur in the current time in a case of programming to record.

(2) startPosition :

Start position of the associated program from the head of media: A plurality of programs may be contained in one media.

(3) durationTime

Length of program:

(4) currentTime

Current reproduction position from the head of media: Updating of "currentTime" occurs momently in the process of reproduction. The reproduction start position is specified according to "the procedure of specifying the target video for reproduction at present on the basis of the schedule table" (Refer to Fig. 15), when switching over from another channel is brought into practice. The video player starts reproduction from this position.

Fig. 18 shows the configuration of program information "TVcontent". The program information "TVcontent" is generated on the basis of a variety of information relating to individual programs distributed through EPG or the like and includes the following components as shown in Fig. 18.

(1) id:

Identification information for identifying programs:

(2) startTime

Broadcasting start time:

(3) endTime

Broadcasting end time:

(4)     channel:

Broadcasting channel number:

(5) title:

Title of program:

5   (6) categories:

Categories of program: A plurality of categories may be set for an individual program.

(7) description:

Detailed information relating to programs:

10   (8) media:

Recorded video data, which is set in recording.

(9) mediaOffset:

Start position of the associated program from the head of media: A plurality of programs may be contained

15   in one media.

(10) status:

Status relating to preservation and reproduction for watching of program contents, inclusively of the status of program contents programmed to delete, in process of

20   reservation, preserved, recorded and programmed to record:

(11) reservedTime

Reservation time which is a component available only when status of the program contents in reservation is

25   selected.

The components (1) to (7) among the above components of "TVcontent" are provided through EPG or the like in data broadcasting service.  On the other hand, other components need to be set arbitrarily in the

30   recording/reproducing system 10.

The component (1) "id" is configured by a

combination of series id and each broadcasting time id, for instance, and may be applied to define the programs clearly as the same series of programs or to automatically record the same series of programs without any omission or to continuously reproduce the same series of programs on the same virtual channel.

The component (10) "status" may be set automatically with the recording/reproducing system 10 or manually by the user in the manner of touching the "deletion" button on the operation panel of the remote controller 60 of the like.

Fig. 19 schematically shows the flow of data in case of generating "scheduling" on the basis of "TVcontent".

The "durationTime" of the "Scheduling Unit" is calculated on the basis of a difference between "startTime" and "endTime" of "TVcontent".

Further, "startTime", "title" and "categories" are copied intact from "TVcontent" to "Scheduling Unit.

Further, the "source" of the "scheduling" holds a reference to the corresponding the "TVcontent". The "title" and "categories" are considered to be redundant components and therefore, may be configured to be referred to one after another through the "source" by deleting a field, if the user does not care about efficiency.

The "startTime" of the "Scheduling Unit" holds the program broadcasting time as an initial value, while being updated in scheduling. The "status" is also updated on the recording/reproducing system 10 in recording and so on.

Fig. 20 schematically shows the flow of data in a
case of generating the "Play Unit" on the basis of the
"Scheduling Unit".

The "durationTime" of the "Scheduling Unit" is
5    copied onto the "durationTime" of the "Play Unit".

Further, the "media" and the "mediaOffset" are
respectively copied from the "TVcontent" onto the "media"
and the "startPosition" of the "Play Unit" through the
"source" of the "Scheduling Unit".

10   Further, the "currentPosition" of the "Play Unit" is
initialized to zero, while being updated at any time on
the recording/reproducing system 10.

Fig. 21 shows the components of the "ToWatchEntry"
added to the "To watch list" (Refer to Fig. 10).

15   (1)   currentPosition:

Current position:

(2)   title:

Title of program:

(3)   durationTime

20       Length of program:

(4)   status:

Current program status, inclusive of the status of the
program in the process of being paused and reproduced or
the like.

25   (5)   source:

Corresponding program information ("TVcontent")


In the embodiment of the present invention, the
"ToWatchEntry" is created every paused program for
30   addition to the "To Watch list".  The "To watch list"
manager uses such information to provide a display of the


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title of the reproducing program in the process of reservation for the "To Watch list" (Refer to Fig. 10). On the other hand, the user may resume (or start) the interrupted program reproduction by selecting any program from the list box.

The "To watch list" may also be configured to be placed in a non-volatile hold state for the duration of disconnection of power from the system, or alternatively to delete a specific entry from the "To Watch list" according to the explicit instructions from the user.

As has been described in the foregoing, the present invention makes it possible to provide the recording/reproducing system, which is satisfactory to permit the automation of video recording and recording schedule reservation of programs sent on the air from the broadcasting stations.

The present invention also makes it possible to provide the recording/reproducing system, which is satisfactory to support the reproduction and watching operations of a large number of automatically recorded videos.

The present invention further makes it possible to provide the recording/reproducing system, which is satisfactory to permit the facilitation of selection and management of recorded videos in the manner of following the operations of general AV equipment such as televisions and video decks.

The present invention further makes it possible to provide the recording/reproducing system, which is satisfactory to permit the reflection on management of preservation of recorded videos while grasping user's

intention accurately.

According to the present invention, the recorded
videos are sorted into categories, and the virtual
channels may be assigned to the categories. Since only
5     the programs suited to a specific category may be
recorded into the virtual channel, if configured
according to the category defined by the user, the user
oneself may estimate with higher accuracy what kind or
content of programs are included in which channel.
10    Further, when there is the need for sharing the
recording/reproducing system among a plurality of users
for domestic use or the like, the virtual channels may be
assigned every user as well.

The recorded programs are set in array on the time
15    base on each virtual channel, permitting concurrent
reproduction on each virtual channel. On the other hand,
the virtual channels having no chance to bring watching
into practice by the user are good enough to advance the
reproduction start point on the occasion of channel
20    selection with the lapse of real time, without the need
for activating the process of reproducing the recorded
programs programmed to reproduce at the pertinent time.
The user may happen to watch various recorded programs
only through the operation of switching over the channels
25    from one to another or continuing to reproduce the
recorded programs on a certain one channel after
application of power at any time. It is to be understood
that a quite passive style is sufficient for the user to
watch the recorded programs.
30    The recording/reproducing system according to the
present invention permits the user to watch the recorded

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programs only through the operation which is quite
familiar to the general television receiver like the
channel switching operation.  That is, it is not
necessary for the user to learn a new operating method
5    other than the channel switching operation, and besides,
an active operation or watching pose is not required for
the user to reproduce the recorded videos.  Thus, the
recording/reproducing system of the present invention is
easily acceptable to the user having the passive watching
10   style and also permits a reduction in number of simply
recorded programs kept idle without a chance to be
reproduced.

     The recorded videos reproduced on the virtual
channels are stored in the high-speed random-accessible
15   recording media such as HDD, permitting an access to a
desired reproduction start point at high speed through
the "fast forward" and "rewind" operations.  Further,
since the recording/reproducing system according to the
present invention adopts well-experienced operation modes
20   such as the "fast forward" and "rewind" operations of the
video deck, the user does not need to learn a new
operating method.

     The recording/reproducing system of the present
invention may reflect the priority of each recorded
25   program on scheduling of programs to reproduce on the
virtual channels to control the number of times and the
time period to arrange the programs.  The
recording/reproducing system, if sets the priority of
each program on the basis of the user's tastes and
30   profile information, for instance, makes it possible to
locate the programs, supposed to be desired to watch by

the user in particular, in the prime time or like time period quite within the bounds of the possibility that the user might watch the programs on television, permitting the improvement of probability that the user

5 might catch one's attention on the programs. Thus, the recording/reproducing system of the present invention is considered to be excellent in facility.

The recording/reproducing system of the present invention makes it possible to manage information to the

10 effect that which reproduced program was watched by the user on the system. Thus, the recording/reproducing system, if configured to prevent the programs once having been watched from being incorporated into the period of the future on the time base of the virtual channel, may

15 eliminate the useless action of watching the same program over and over.

Since the recorded programs are set in array according to their status (i.e., the state of programs programmed to record, recorded and programmed to delete

20 or the like) every virtual channel, the user may watch the programs continuously or select the operation object simply through the "fast forward", "rewind" or like unified well-experienced operation. The user may search and specify the desired program to reproduce by intuition

25 without the need for watching the screen for the view of programs.

The recording/reproducing system according to the present invention makes it possible to apply a plurality of program tables such as lists of recording schedule

30 programs, recorded programs and deletion schedule programs (restorable) to single scheduling of programs to

reproduce in the unified manner.  Thus, the user gains an access to the desired programs to reproduce continuously (i.e., a series of programs such as serial drama) only through the fast forward, rewind or like unified

5    operation while following only a list of a single kind of programs with eyes without the need for switching the screen every purpose.  The user may give instructions to delete, preserve and reserve the recorded programs and also to cancel each operation by touching the buttons of

10   the remote controller while watching the reproduced videos, resulting in no need for display of the reproduced videos onto the individual operation screens through switch-over operation.  Thus, the recording/reproducing system of the present invention, if

15   configured to locate a series of programs continuously on the same channel, permits the user to watch the series of programs together and besides, may prevent the simply recorded programs from being kept idle.

On the program-scheduled virtual channel in the

20   recording/reproducing system according to the present invention, the programs having been watched by the user are located in the period of "the near past" on the time base every channel.  Thus, the user may search by intuition the programs in such a way as to find "the

25   program having been once watched previously" through the "rewind" operation on the same channel.  Further, since the program having been watched by the user more recently is located in the period of the "nearer past" on the time base, such an array of programs may be easily understood

30   in view of a human mechanism of memory.  On the other hand, since the program programmed to be deleted is

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located in the period of "the remote past" every channel, the user gains an access to a desired recorded program according to a unified method.

The recording/reproducing system according to the
5   present invention makes it possible to hold paused information relating to the programs in the process of being paused as a list independent of the channel operation. Thus, a random access to the recording media such as a hard disk may be applied to resume the
10  reproduction of paused program quickly at any time. The processing of resuming the reproduction of paused program as described the above requires no channel switching nor "fast forward" and "rewind" operations of the recording media. Further, the paused information is added to or
15  deleted from the list automatically in response to the instructions given by the user to pause the programs or resume the reproduction, it is not necessary for the user oneself to mark or tag the programs for storage, permitting the simplification of operations.
20      The recording/reproducing system of the present invention, if configured to hold the storage list of the paused information in a non-volatile manner even for the duration of disconnection of power, makes it possible to resume the reproduction of programs in the future (that
25  is, after the lapse of a considerable period of time). Since it is assumed that the user has a mind to resume the reproduction of programs when bringing the pausing operation into practice explicitly, no operational inconvenience in such operation is considered. Further,
30  the recording/reproducing system of the present invention, if configured to hold the information of videos in the

process of being paused as the list (i.e., the "To Watch list") independent of the ordinary channel operation, makes it possible to prevent interference with the reproduction of the other programs on the same channel.

5       While the invention has been described in detail with reference to the specific embodiments, it is to be understood that various changes and modifications will be apparent to those skilled in the art without departing from the spirit and scope of the present invention. That

10   is, having described the invention as related to the embodiment, it is to be understood that the invention be not limited to any of the details of the above description. The scope of the invention is therefore to be determined solely by the appended claims.

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